Maritime aerosol optical properties measured on the Korean R/V Araon in both Antarctic and Arctic regions

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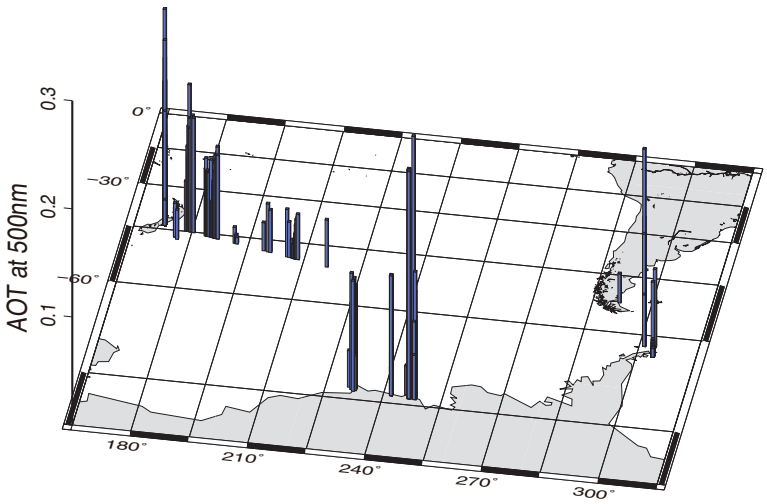
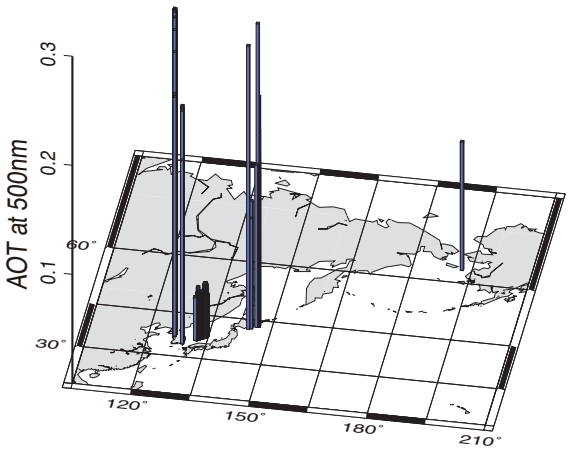
Atmospheric aerosol particles affect the climate by scattering and absorbing solar radiation. Aureolemeter measures both direct and scatterd solar radiation to derive the aerosol optical properties such as optical thickness, volume size distribution, and single scattering albedo. Maritime aerosol optical properties are required because the ocean occupies 70% of the earth's surface area, however, there are few data due to limitation of observation point. We have developed a shipborne-aureolemeter (hereafter SAURE) and start a on-board observation on the R/V Shirase from the 56th Japanese Antarctic Research Expedition (Kobayashi and Shiobara, 2015). The SAURE can measure a skylight distribution as well as the direct solar intensity on a vessel.

New SAURE was installed to the Korean R/V Araon last year. The R/V Araon cruises not only to Antarctic Ocean but also to Arctic Ocean. The SAUREs on the R/V Shirase and the R/V Araon cover both Antarctic and Arctic Oceans and transit cruises between Asia and high latitude regions.

In this study, we report the SAURE measurements of the R/V Araon's Antarctic cruise from December 2017 to May 2018 and the Arctic cruise from July 2018. The measurement results of the aerosol optical thickcess (AOT) are showed in Figure 1. In the Antarctic cruise (Fig.1(a)), the AOT showed as low as less than 0.1 excluding coastal waters and sometimes decreased very low values less than 0.05. In the eastern waters of New Zealand, the AOT was relatively high. This result indicates the aerosol particles came from New Zealand main island. In the Arctic cruise (Fig.1(b)), The AOT was around 0.05 at the middle of the Japan Sea. It was under the high-pressure system in the Pacific Ocean. Therefore, the aerosol amount was very low. In Incheon and Busan ports, the AOT ranged 0.2~0.3. Their points locate close to big city and affected by human activity. We plan to continue observation in the future.



(a) Antarctic cruise from December 2017 to may 2018



(b) Anrctic cruise from July to August in 2018

Figure 1. Results of aerosol optical thickness measured with the ship-borne aureolemeter on the Korean R/V Araon.

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References

Kobayashi, H., and M. Shiobara, Development of new shipborne aureolemeter to measure the intensities of direct and scattered solar radiation on rolling and pitching vessel, Proc. SPIE 9640, Remote Sensing of Clouds and the Atmosphere XX, 96401A (16 October 2015); doi: 10.1117/12.2195691.